
Designing Classroom Technology to Meet the Needs of All

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Abstract

In today's classrooms students who present with a wide range of abilities and challenges, are learning together. That some students have learning "challenges" is not the point. Rather, the true "challenges" lie with us – to universally design classrooms, technology, and pedagogical practice that reach and teach all students.

A team at Upper Canada District School Board (UCDSB) is studying how mainstream educational technology, in conjunction with what is generally thought of as "special needs" software/hardware, can act as a catalyst for inclusive classroom practices - "necessary for some good for all". Combining technology with good instruction enhances educational and social participation for all students including those with disabilities.

Keywords Universal Design for Learning, collaborative learning, multi-touch table, interactive whiteboards

ACM Classification Keywords

K.3.1 Computer Uses in Education

Introduction

Inclusive education involves students from diverse backgrounds and with a wide range of abilities learning together in regular schools and classrooms. When students with significant learning challenges are

included in regular classrooms they must not simply be present, working on alternative and/or individual programs. They must be *engaged* in learning academic content in relevant areas with classmates (i.e., reading, writing, math); they should be given opportunities to form social relationships; and they must acquire relevant, functional skills in non-academic areas. *The goal for all students is meaningful educational and social participation.* In order to achieve successful inclusion, the onus must not be placed on the student to change to fit the curriculum, but rather the curriculum and supportive technology must be designed at the outset to accommodate all learners. Just as it would be unthinkable to design public buildings without making them universally accessible to all people regardless of physical limitations, the consideration of universal design for learning principles should be imperative when designing instructional strategies, materials and technology to accommodate all learners.

The Role of Technology

In order to promote access to the curriculum, assistive technology (AT) and alternative and augmentative communication (AAC) tools have long been purchased for individual students with disabilities to offer alternative means of expression and representation. However, this can result in barriers to effective classroom implementation. There is often stigma around being the only student in a regular education classroom who uses AT/AAC. Teachers have difficulty finding the time to learn how to harness the potential of a student's individual technology and to support its use within the classroom curriculum. The student does not receive modeling in its use and is not made accountable for its use to support learning [4].

As more traditional instructional approaches to teaching, learning, and technology use are enhanced by approaches in line with 21st century knowledge building and skill, new digital technologies are becoming more readily available. The active application of subject knowledge for solving real world problems within more collaborative-learning environments demands the introduction of technologies that link the classroom with the world beyond the classroom [3]. Designers of classroom technology have the ability to design for all and need to consider their role in supporting inclusive learning environments and pursue the objectives of "Design for All" (DfA) that has been defined as design for human diversity, social inclusion and equality [6].

Smart Inclusion Pilot Project

During the 2008-2009 school year, a multi-disciplinary team, which included Speech-Language Pathologists and Teaching Colleagues at the UCDSB initiated the Smart Inclusion pilot project. This project introduced a framework of tools and strategies, which enabled 12 students with severe communication challenges to learn meaningful academic content alongside peers in whole and small group instruction. As part of this initiative SMART Boards™ were introduced into classrooms along with a variety of application software and AAC tools that, while considered necessary to support communication and programming for the "target" student with severe communication challenges, were also selected for their utility in whole and small group instruction. These tools were therefore considered essential to augment and assist not only communication, but meaningful educational and social participation in the classroom; necessary for some, good for all.

The Smart Inclusion framework situates technology within the context of Universal Design for Learning (UDL)- multiple means of representation, expression/action and engagement, Differentiated Instruction (DI) – designing, teaching and learning for diversity [7] - and the Participation Model (PM) - PM “captures” those who fall through the UDL and DI net by identifying and circumventing the barriers to participation in learning that may still exist. [5, 1].

During the 2008-09 school year, pre and post data was collected on target students for whom technology (e.g., AT, interactive whiteboards, slates, document cameras) was obtained through government funding. Qualitative and quantitative data was gathered through observations, surveys and interviews, speech-language assessments, and reviews of report cards on: academic and social participation, communication skills, behaviors, learning skills, and inclusion.¹ By the end of the school year, target students were spending more time in class and were engaged more often in learning activities with peers compared to the prior school year. Similarly, students were being provided with more communication opportunities and made more successful communication attempts in class, and all target students demonstrated growth in their speech and language skills.

¹ Complete data across all measures are available for 8 of 12 students ranging in grade level from Kindergarten to High School. One student who was initially part of this project moved out of Board mid-way through data collection; consent was not given for another student to discuss and present data beyond classroom teams; only partial data is available for another 2 students (i.e., items left blank; interviewees unavailable; etc).

In 2009-10 more classrooms at UCDSB introduced the SMART Board for whole and small group instruction working within the smart inclusion framework. At the start of the 2010-11 school year one school layered in the SMART Table™ interactive learning center. Anecdotal reports by teachers suggest that the SMART Table supports students in many of the ways the SMART Board had proven beneficial, and offers a new format for a small collaborative group learning environment.

Design for All – An Analysis of SMART Technology

With the advent of technology, it is now possible to design tools for the classroom that will allow all students, including those with severe communication challenges, to learn together by facilitating true universal design for learning. The following is an example of how SMART Technology supports the tenets of UDL: multiple means of engagement, representation, action and expression.

Multiple means of engagement: The SMART Table offers a horizontal 360 degree, multi touch surface that enables collaboration among students. The SMART Board and Table offer multiple formats (auditory, visual, kinesthetic) to vary levels of challenge and support, and enhance relevance. Both platforms offer increased opportunities for all students to collaborate and communicate.

Multiple Means of Representation: Teachers can customize the display of information by introducing text, graphics (including symbol support), audio and video clips to activities that run on the SMART Board or SMART Table. This flexibility allows illustration of key

concepts in both linguistic and non-linguistic ways, so that all students can understand what is presented.

Multiple Means of Action and Expression: The SMART Board and SMART Table provide students with varied ways to respond and interact with materials. Students with physical access challenges can use fingers, an elbow, or any object they can get their fingers around. Failing this, the SMART Board and Table offer some integration of assistive technologies including joysticks and voice output devices to promote expression. Activities can also be designed with choices for communicating ideas and expressing understanding. For example, an activity pack - Hot Spaces - could have students categorizing a variety of objects, using Multiple Choice to answer questions about shapes, and Paint could task students with drawing shapes. The 360 degree orientation of the table when coupled with a variety of cooperative activities encourages communication amongst students whether through discussion or, for students with communication challenges, by pointing or moving items on the table's surface [2].

Discussion and Evolving the Technology

SMART Boards and SMART Tables, as well as other mainstream technology, such as the IPAD, were not designed specifically as UDL tools but rather as general technology tools to support education and business. However, the UCDSB team combined mainstream and assistive technology with good instruction to act as catalysts for inclusive learning environments. If technology designers had a better understanding of the diversity in their end-users, could tools for education be designed from the outset to include all students? Could this tear down the divide between educational

technology and assistive technology, creating tools that make it easier for teachers to offer true universal design for learning that reaches and teaches all students?

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